The Importance of Armenian for Understanding the Development of the Proto-Indo-European Phonological System in Old Indic, Greek, and Italic

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The paper explores the important role that Armenian has to play in understanding the development of the glottalic model of the Proto-Indo-European consonant system in Old Indic, Greek, and Italic.

INTRODUCTION

This is the last in a series of articles designed to demonstrate how the glottalic model of Proto-Indo-European consonantism is a viable alternative to the traditional reconstruction and can readily account for all of the early phonological developments in the older Indo-European daughter languages. The first paper, which was published in 2016, was entitled "The Glottalic Model of Proto-Indo-European Consonantism: Re-igniting the Dialog". This paper dealt mainly with a review and refutation of all of the criticisms that have been leveled against the Glottalic Theory to date. The second paper, which was published in 2019 in the *Journal of Indo-European Studies*, is entitled "The Origins of Proto-Indo-European: The Caucasian Substrate Hypothesis". This paper provides corroborating evidence for the Glottalic Theory on the basis of early language contact between Proto-Indo-European and primordial Northwest Caucasian languages. The third paper, which was published in *Wékʷos* in 2019, is entitled "The Importance of Hittite and the Other Anatolian Daughter Languages for the Reconstruction of the Proto-Indo-European Phonological System". This paper explores how Hittite and the other Anatolian daughter languages provide powerful support for the Glottalic Theory.

The current paper addresses the development of the revised Proto-Indo-European phonological system in the various non-Anatolian Indo-European daughter languages, concentrating, in

particular, on Armenian, Old Indic (Indo-Aryan), Greek, and Italic. Here, Armenian has a crucial role to play in understanding the developments in the early prehistory of these daughter languages.

We will begin by looking at Disintegrating Indo-European and then discuss Germanic, Celtic, Slavic, and Baltic, after which we will move on to Armenian and finish with Indo-Iranian, Greek, and Italic. For the sake of simplicity and continuity, I will repeat (and expand upon) what I have previously written. Albanian and Tocharian will not be considered here (but see Bomhard 2018, vol. 1, Chapter 5).

DISINTEGRATING INDO-EUROPEAN

In my 2019 paper "The Importance of Hittite and the Other Anatolian Daughter Languages for the Reconstruction of the Proto-Indo-European Phonological System", I expressed support for the theory that the Anatolian languages were the first to separate from the rest of the Indo-European speech community, and I proposed that the phonological system to be reconstructed for pre-Anatolian Proto-Indo-European was as shown below (column 1 is voiceless aspirated, column 2 is glottalized, and column 3 is plain voiced):

	(1)	(2)	(3)			
Obstruents:	p^h	p’	b	(bilabial)		
	t^h	t’	d	(dental)		
	k^h	k’	g	(velar)		
	k^{wh}	k'^w	g^w	(labiovelar)		
		s				
Laryngeals:	H_1	H_2	H_3	H_4		
Nasals and Liquids:	m/m̥	n/n̥	l/l̥	r/r̥		
Glides:	w(/u)	y(/i)				
Vowels:	e	o	a	i	u	ə
	ē	ō	ā	ī	ū	

Furthermore, I noted that the following series of phonological changes may be assumed to have taken place in the Indo-European parent language after the separation of the Anatolian branch and

before the emergence of the individual non-Anatolian Indo-European daughter languages:

1. The laryngeals *H_1 and *H_4 were lost initially before vowels, while *H_2 > *h and *H_3 > *$ĥ$ > *h in the same environment.
2. Next, all medial and final laryngeals merged into *h.
3. The single remaining laryngeal *h was then lost initially before vowels (except in pre-Armenian) and medially between an immediately preceding vowel and a following non-syllabic. This latter change caused the compensatory lengthening of preceding short vowels, thus:

eHC	>	ēC
oHC	>	ōC
aHC	>	āC
iHC	>	īC
uHC	>	ūC

4. *h was preserved in all other positions. *h had a syllabic allophone, *$h̥$, when between two non-syllabics. This syllabic allophone is the traditional schwa primum (*$ə$).
5. Glottalization was probably lost in late Disintegrating Indo-European itself just as the individual non-Anatolian daughter languages were beginning to emerge.
6. The earlier plain voiced stops developed into voiced aspirates (column 3 above), at least in some dialects of Disintegrating Indo-European.
7. The *e ~ *a qualitative Ablaut of pre-Anatolian Proto-Indo-European developed into an *e ~ *o Ablaut.
8. New Ablaut relationships developed as a result of the loss of laryngeals.

For the latest period of development of the Indo-European parent language, the stage I call “Disintegrating Indo-European” — after the separation of the Anatolian branch from the rest of the Indo-European speech community and before the emergence of the individual non-Anatolian Indo-European daughter languages —, I suggested that the Proto-Indo-European antecedent of the satəm daughter languages is to be reconstructed as follows (column 1 is

voiceless aspirated, column 2 is glottalized [ejectives], and column 3 is voiced aspirated):

	(1)	(2)	(3)			
Obstruents:	p^h	p’	b^h	(bilabial)		
	t^h	t’	d^h	(dental)		
	k^{yh}	$k’^y$	g^{yh}	(palatovelar)		
	k^h	k’	g^h	(velar)		
	k^{wh}	$k’^w$	g^{wh}	(labiovelar)		
		s				
Laryngeals:		h/ḫ				
Resonants:	m/m̥	n/n̥	l/l̥	r/r̥	w/u	y/i
Vowels:	e	o	a	(i)	(u)	ə
	ē	ō	ā	ī	ū	

The most significant difference between the phonological system of the Disintegrating Indo-European antecedent of the satəm dialects and that of the centum dialects was in the treatment of the gutturals. In the centum dialects, the labiovelars did not become delabialized, and the palatovelars remained subphonemic.

The phonological system of the Disintegrating Indo-European antecedent of the centum daughter languages, on the other hand, may be reconstructed thus (column 1 is voiceless aspirated, column 2 is glottalized, and column 3 is voiced aspirated:

	(1)	(2)	(3)			
Obstruents:	p^h	p’	b^h	(bilabial)		
	t^h	t’	d^h	(dental)		
	k^h	k’	g^h	(velar)		
	k^{wh}	$k’^w$	g^{wh}	(labiovelar)		
		s				
Laryngeals:		h/ḫ				
Resonants:	m/m̥	n/n̥	l/l̥	r/r̥	w/u	y/i
Vowels:	e	o	a	(i)	(u)	ə
	ē	ō	ā	ī	ū	

Note: Even though I have reconstructed a series of voiced aspirates above (column 3), such sounds are really only needed to explain developments in Armenian, Old Indic, Greek, and Italic, as we shall see below.

GERMANIC

To begin, I would like to address a statement made by Fulk in his recent book *A Comparative Grammar of the Early Germanic Languages* (Fulk 2018:100):

> The chief implication of the glottalic theory for Germanic linguistics is that it permits Germanic (along with Armenian) to be regarded not as a highly innovative branch in its consonantism but as an exceptionally conservative one, whereas the IE languages usually regarded as hewing closest to the PIE consonant system, especially Sanskrit and Greek, turn out to do nothing of the sort. That Germanic should have remained so conservative while the European languages in closest proximity to it in prehistoric times all altered the inherited obstruents in similar ways is difficult to credit. And yet although the glottalic theory is not now widely supported, there is a considerable degree of concurrence that the reconstruction of PIE obstruents represented in §6.1 is implausible and awaits replacement by a creditable reconstruction. Nonetheless, it need not be the case that such an alternative reconstruction is what must be assumed for the latest stages of PIE, since it is of course possible that the typological peculiarities of PIE mentioned above are the consequence of an earlier obstruent system that had already changed before any of the extant IE families had developed individuating characteristics. That is to say, it is not a given that any IE language should directly reflect that earlier state of affairs rather than a later-developed obstruent system similar to that arrived at (in §6.1) by the comparative method. The supposition that Germanic is an especially archaic branch of IE is at all events unsupported by its verb system, which appears to be a simplification of that reconstructed for late PIE (§12.9), showing no marked resemblance to the Hittite verb system.

I do not understand the logic here. I see no problem whatsoever in viewing a particular language or branch as conservative in one area and innovative in another. This means that the innovations in the Germanic verb system do not preclude the retention of archaic features in the Germanic phonological system. (Note: This does not imply that there is any fault with Fulk's book as a whole — it is an excellent monograph and a valuable resource, comprehensive in scope and current in its coverage of the field.) This same point is made by Hejná—Walkden (2022:262) in their discussion of the difference in the rates of change of noun morphology as opposed to verb morphology between Old English and Middle English:

> If you pause at this point to compare the verbal endings in Old English with the ones presented for Middle English in the last chapter (§5.3.2), you'll see that on the whole there's not a huge amount of difference: the big changes in verbal morphology in English take place between the Middle and Modern periods. This is different for nominal morphology, which (as you'll soon see) is considerably more complex in Old English than in Middle English. This kind of fluctuation in rates of change is not unusual! It's not the case that all aspects of a language have to change at the same speed or at the same time, …

Germanic, like Armenian, is extremely conservative in its phonology — the Disintegrating Indo-European consonant system is preserved better in these two branches than in any of the other daughter languages. Unlike Armenian, however, Germanic preserves the older contrast between velars and labiovelars, though, in the course of development, they first became voiceless fricatives and then, at a later date and under certain specific conditions, voiced fricatives (see below for details). Armenian, on the other hand, belongs to the satəm group of languages and is, therefore, descended from that form of Disintegrating Indo-European in which this contrast was replaced by a contrast between palatovelars and plain velars.

In the pre-Germanic dialect of Disintegrating Indo-European, the glottalics were deglottalized, resulting in the following system, with the three-way contrast (1) voiceless aspirated ~ (2) plain (unaspirated) voiceless ~ (3) plain voiced (note: voiced aspirates are not needed in order to account for the Germanic developments):

	(1)	(2)	(3)
Bilabial:	p^h	p	b
Dental:	t^h	t	d
Velar:	k^h	k	g
Labiovelar:	k^{wh}	k^w	g^w

Note: Glottalization may have been preserved in pre-Germanic in series 2 above. Glottalization has been proposed to account for the vestjysk stød in Danish and Icelandic preaspiration (cf. Kortlandt 1988).

The following series of changes can be postulated for the development of the Disintegrating Indo-European system of obstruents into the system found in Proto-Germanic:

1. The voiceless aspirates (series 1) become voiceless fricatives: *p^h, *t^h, *k^h, *k^{wh} > *f, *$þ$, *$χ$, *$χw$, except after *s-.
2. Later, the resulting voiceless fricatives became the voiced fricatives *$ƀ$, *$ð$, *$ɣ̄$, and *$ɣ̄w$, respectively, except (A) initially and (B) medially between vowels when the accent fell on the contiguous preceding syllable (Verner's Law). *s was also changed to *z under the same conditions. Cf. Fulk 2018:107—110.
3. *b remained initially, in gemination, and after nasals; *d initially, in gemination, and after nasals, *l, *z, and *g; and *g only in gemination and after nasals. In other positions, however, *b, *d, *g were changed into the voiced fricatives *$ƀ$, *$ð$, *$ɣ̄$, respectively. *g^w became *$ɣ̄$ initially and *w medially (cf. Wright—Wright 1925:131).

The resulting Proto-Germanic consonant system may thus be reconstructed as follows (cf. Fulk 2018:102—112; Moulton 1972):

	Stops		Fricatives	
Bilabial:	p	b	f	ƀ
Dental:	t	d	þ	ð
Velar:	k	g	χ	ɣ̄
Labiovelar:	kw	(gw)	χw	(ɣ̄w)

In Germanic, **a* and **o* merged into **a*, and **ā* and **ō* merged into **ō*. **e* become **i* (A) before a nasal plus consonant (**eNC* > **iNC*) and (B) when **i*, **ī*, or **y* followed. **ey* became **ī*. **i* was changed to **e* and **u* to **o* when **a*, **o*, or **e* appeared in the following syllable except when a nasal plus consonant intervened. In the sequences **anχ*, **inχ*, and **unχ*, the *n* was lost, and the vowels were lengthened. **m̥*, **n̥*, **l̥*, and **r̥* developed into **um*, **un*, **ul*, and **ur*, respectively.

The Proto-Germanic vowels and diphthongs may be reconstructed as follows:

Vowels:	i	u	ī	ū
	e		ē	ō
		a		
Diphthongs:	ay	aw	ew	

The consonantal resonants remained unchanged except that final **m* became **n*. This change is also found in Anatolian, Greek, Celtic, and probably Balto-Slavic.

The inner-Germanic developments are quite complicated, and Fulk's 2018 book mentioned above should be consulted for details. See also Stiles 2017; Bousquette—Salmons 2017:391—398.

CELTIC

In the pre-Celtic dialect of Disintegrating Indo-European, the glottalics were deglottalized, resulting in the following system, with the three-way contrast (1) voiceless aspirated ~ (2) plain (unaspirated) voiceless ~ (3) plain voiced (note: voiced aspirates are not needed in order to account for the Celtic developments):

	(1)	(2)	(3)
Bilabial:	p^h	p	b
Dental:	t^h	t	d
Velar:	k^h	k	g
Labiovelar:	k^{wh}	k^w	g^w

The following discussion will be confined to Old Irish; only the major developments will be discussed:

1. The earlier dental and velar ejectives (**t'* and **k'*) merged completely with their plain voiced counterparts (**d* and **g*) in Pre-Celtic. The developments may be assumed to have been ejective > plain voiceless stop (through deglottalization) > voiced stop (through voicing): **t'* > **t* > **d* and **k'* > **k* > **g*. There is no evidence in Proto-Celtic for an earlier bilabial ejective **p'*.
2. Next, the voiced labiovelar **g^{w}* was delabialized and merged with **g*.
3. Then, the glottalized labiovelar **k'^{w}* developed (A) into **b* initially and medially after consonants and (B) into **g* initially before **u* and medially between vowels and before consonants.
4. Original **p^{h}* was lost in all of the Celtic languages: **p^{h}* > **h* > **Ø*. However, *p* has been reintroduced into Old Irish through loanwords.

The consonants developed positional allophones under various conditions:

1. Palatal allophones developed in the vicinity of original **i*, **ī*, **e*, and **ē*.
2. Velar allophones arose in the vicinity of original **u* and **ū*.
3. Neutral allophones were found in the vicinity of original **a*, **ā*, **o*, and **ō*.

In Old Irish, the palatal and velar allophones were indicated as such in writing by surrounding vowels. Unpronounced vowels were often introduced to indicate the quality of the following consonant. /p, t, c, b, d, g/ became the fricatives /f, θ, χ, v, ð, ɣ/ (written *ph*, *th*, *ch*, *b*, *d*, *g*), respectively, initially after words that end or that formerly ended in a vowel and medially between vowels. /m, n, l, r/ became /μ, ν, λ, ρ/ (written *m*, *n*, *l*, *r*), respectively, and /s/ became /h/ under the same conditions. /μ/ was probably a nasalized /v/, while /ν, λ, ρ/ were lax variants of /n, l, r/. Consonants were changed as follows initially when the preceding word ended or formerly ended in a nasal:

1. /p, t, c/ became /b, d, g/ (written *p*, *t*, *c*)
2. /b, d/ first became /mb, nd/ and then /mm, nn/

3. /f/ became /v/ (written *b*)
4. /n/ was written before vowels
5. /s, r, l, m, n/ were doubled after proclitic vowels

Old Irish thus had the following system of consonants (the written form is given first followed by the allophones in slashes):

p	/p, b/	t	/t, d/	c	/k, g/
ph	/f/	th	/θ/	ch	/χ/
f	/f/	s	/s/		
b	/b, v/	d	/d, ð/	g	/g, ɣ/
m	/m, µ/	n	/n, ν/	[n]	/ŋ/
	l	/l, λ/	r	/r, ρ/	
	h	/h/			

Except for the merger of **ō* and **ā* into *á* and of **ī* and **ē* into *í*, the long and short vowels were mostly preserved in accented syllables. In unaccented syllables, vowels were either lost or subject to various modifications governed by a complicated set of rules. **i* and **u* became *e* and *o*, respectively, under the influence of *a* or *o* in the following syllable. **ew* and **ow* merged into *ó*/*úa*, **ey* became *é*/*ía*, **oy* became *óe*/*oí*, and **ay* became *aí*/*áe* in accented syllables. The Old Irish vowel system was as follows:

Vowels:	i	e	a	o	u
	í	é	á	ó	ú
Diphthongs:	íu	ía		úa	uí
		éu/éo		oí/óe	
		áu		ái/áe	

**y* was lost. **w* became *f* initially and *b* /v/ after *r*, *l*, *d*. **m*, **n*, **l*, **r* were preserved except that final **m* became *n*. In the sequences **Vnt*, **Vnc(h)*, and **Vns*, the **n* was lost, and the preceding vowel was lengthened. The developments of the syllabic nasals and liquids were complicated, though, in general, **m̥*, **n̥*, **l̥*, **r̥* became *am*, *an*, *al*, *ar*, respectively, before vowels and *em*, *en*, *li* (*le*), *ri* (*re*), respectively, elsewhere.

For details on the inner-Celtic developments, cf. Lewis—Pedersen 1937:1—157; Pedersen 1909 (vol. I); Sims—Williams 2017:361—367; Stifter 2017.

SLAVIC

In the pre-Slavic dialect of Disintegrating Indo-European, the glottalics were deglottalized, resulting in the following system, with the three-way contrast (1) voiceless aspirated ~ (2) plain (unaspirated) voiceless ~ (3) plain voiced (note: voiced aspirates are not needed in order to account for the Slavic developments):

	(1)	(2)	(3)
Bilabial:	p^h	p	b
Dental:	t^h	t	d
Palatovelar:	k^{yh}	k^y	g^{yh}
Velar:	k^h	k	g
(Labiovelar:	k^{wh}	k^w	g^w)

Note: Glottalization may have preserved in series 2 into pre-Balto-Slavic. Glottalization has been proposed as an explanation for Winter's Law (on which, cf. Collinge 1985:225—227).

In Pre-Slavic, Pre-Baltic, Pre-Indo-Iranian, Pre-Armenian, and Pre-Albanian (the so-called "satəm" languages), the velars developed palatalized allophones when contiguous with front vowels, apophonic **o*, and **y*. In the early prehistory of these branches, the labiovelars were (perhaps only partially at first) delabialized. The newly delabialized (labio)velars merged with the unpalatalized allophones of the velars. This change brought about the phonemicization of the palatals since both palatalized velars (from earlier plain velars) and unpalatalized velars (from earlier labiovelars) were now found in the vicinity of front vowels, apophonic **o*, and **y*.

The following series of changes can be postulated for the development of the Disintegrating Indo-European system of obstruents into the system found in Proto-Slavic:

1. The ejectives merged completely with the plain voiced stops (**b*, **d*, **g*^{y}, and **g*) in Pre-Slavic. The development may be assumed to have been ejective > plain voiceless stop (through deglottalization) > voiced stop (through voicing): **p'* > **p* > **b*, **t'* > **t* > **d*, **k'*^{y} > **k*^{y} > **g*^{y}, and **k'* > **k* > **g*. The loss

of glottalization caused lengthening of preceding contiguous short vowels (Winter's Law).

2. Then, the voiceless aspirates were deaspirated: *p^h, *t^h, *k^{yh}, *k^h > *p, *t, *k^y, *k. Note: there are a small number of examples in which *k^h appears to become *x in Proto-Slavic. These are best explained as borrowings, probably from Iranian (cf. Carlton 1991:95).
3. After *r, *u, *k, *i, *s became *x (> *$š$ before front vowels) (this is the so-called "ruki-rule"). A similar change is found in Indo-Iranian (see below).
4. *k^y and *g^y became *s and *z, respectively. No doubt, the developments were as follows: *k^y > *t^y > *$t\underset{\smile}{s}$ > *s and *g^y > *d^y > *$d\underset{\smile}{z}$ > *z.
5. *k and *g were palatalized to *$č$ and *$ž$, respectively, before front vowels and *y.
6. The syllabic resonants *$m̥$, *$n̥$, *$l̥$, *$r̥$ developed into *i (or *u) plus *m, *n, *l, *r, thus: *$m̥$, *$n̥$, *$l̥$, *$r̥$ > *im, *in, *il, *ir.
7. At a later date, *k and *g were palatalized to *c and *dz, respectively, before *$ě$ (< *oy). *t, *d, *n, *l, *r plus the semivowel *y became *t^y, *d^y, *n^y, *l^y, *r^y, respectively, while *s became *$š$ under the same conditions.
8. *p, *b, *m, *v plus *y became *pl^y, *bl^y, *ml^y, *vl^y, respectively.
9. *a and *o merged into *o, and *$ā$ and *$ō$ merged into *a. *ey and *$ī$ both became *i, and *oy (< *ay and *oy) and *$ē$ became *$ě$. *$ū$ became *y, *i became *$ъ$, and *u became *$ь$. *e plus a nasal became *$ę$ and *o plus a nasal became *$ǫ$. *ow (< *aw and *ow) became *u.

The Common Slavic phonological system may be reconstructed as follows:

Stops:	p	t	t^y	k
	b	d	d^y	g
Fricatives:	f	s	š	x
		z	ž	(γ)
Affricates:		c		
Nasals:	m	n	n^y	
Liquids:		r	r^y	
		l	l^y	
Semivowels:	v		j	

Vowels:			i	y	u			
		ь		ъ			ę	ǫ
	e	o		ě	a			

Note: The palatalized consonants may also be written as follows: **t′*, **d′*, **ń*, **ŕ*, **ĺ*, respectively.

For details on the inner-Slavic developments, cf. Collins 2018; Greenberg 2017:522—533; Kim 2018; Shevelov 1964.

BALTIC

In the pre-Baltic dialect of Disintegrating Indo-European, the glottalics were deglottalized, resulting in the following system, with the three-way contrast (1) voiceless aspirated ~ (2) plain (unaspirated) voiceless ~ (3) plain voiced (note: voiced aspirates are not needed in order to account for the Slavic developments):

	(1)	(2)	(3)
Bilabial:	p^h	p	b
Dental:	t^h	t	d
Palatovelar:	k^{yh}	k^y	g^{yh}
Velar:	k^h	k	g
(Labiovelar:	k^{wh}	k^w	g^w)

The Baltic developments were fairly similar to the early Slavic developments (see above), except that **k^y* and **g^y* became **š* and **ž*, respectively. As in pre-Slavic, the ejectives merged completely with the plain voiced stops in pre-Baltic. Lithuanian shows the change of **s* to **š* after **k* and **r* but not after **i* and **u* as in Slavic and Indo-Iranian. The syllabic resonants **m̥*, **n̥*, **l̥*, **r̥* developed into **i* (or **u*) plus **m*, **n*, **l*, **r*, thus: **m̥*, **n̥*, **l̥*, **r̥* > **im*, **in*, **il*, **ir*. In Lithuanian, *t* plus *j* (= *y*) and *d* plus *j* (= *y*) became *či* and *dži*, respectively; *t* plus *l* and *d* plus *l* became *kl* and *gl*, respectively.

Except for the merger of **a* and **o* into **a*, **ay* and **oy* into **ai*, and **aw* and **ow* into **au*, the vowel system remained reasonably faithful to that of Disintegrating Indo-European. Unlike

Slavic and Germanic, Baltic did not merge Disintegrating Indo-European *$\bar{a}$ and *$\bar{o}$.

The Common Baltic consonant system may be reconstructed as follows:

p	b	m	
t	d	n	
k	g	[ŋ]	
k^y (?)	g^y (?)	[n^y] (?)	
š	ž		
s	(z)		
r	l	y	w

For details on the inner-Baltic developments, cf. Kim 2018; Petit 2018; Young 2017:489—499.

ARMENIAN

In the early prehistory of pre-Armenian, pre-Indo-Iranian, pre-Greek, and pre-Italic, the glottalics first became plain voiceless stops (through deglottalization), and the voiced stops then became voiced aspirates. Next, at a later date, in pre-Indo-Iranian, pre-Greek, and pre-Italic, but not in pre-Armenian, the plain voiceless stops became voiced stops. Armenian, however, preserves the first stage of this shift — that is to say, the plain voiceless stops remained as such and were not changed to voiced stops. Thus, the Classical Armenian phonological system directly attests the three-way contrast (1) voiceless aspirated ~ (2) plain voiceless ~ (3) voiced aspirated in its occlusive system (on the interpretation of the Classical Armenian sounds traditionally transcribed as /b/, /d/, /g/, /j/, and /ǰ/ as voiced aspirates, cf. Godel 1975:9—10; Garrett 1998; Schirru 2012; Seyfarth—Garellek 2018 [Yerevan dialect]).

This is not the whole story, however. There is a tremendous amount of variation in Modern Armenian dialects, in some cases even pointing to the retention of glottalization in series 2. On the other hand, in some dialects, plain voiceless stops correspond to the glottalics, while in still others, plain voiced stops are found (for details, cf. Fleming 2000; Martirosyan 2019:51—60; Vaux 1998). Thus, we have here, in a single, attested Indo-European branch, all

of the changes that the glottalics are thought to have undergone in the various other non-Anatolian Indo-European daughter languages (retention, voicing, deglottalization)! There is no need to invoke typological parallels nor to formulate elaborate hypotheses — Armenian has it all!

For the pre-Armenian dialect of Disintegrating Indo-European, I would reconstruct the obstruent system as follows, taking into consideration all of the evidence from the Modern Armenian dialects, as well as Classical Armenian (column 1 is voiceless aspirated, column 2 is glottalized, and column 3 is voiced aspirated):

	(1)	(2)	(3)	
Obstruents:	p^h	p’	b^h	(bilabial)
	t^h	t’	d^h	(dental)
	k^{yh}	k'^y	g^{yh}	(palatovelar)
	k^h	k’	g^h	(velar)

The following series of changes can be postulated for the development of the Disintegrating Indo-European system of obstruents into the system found in Classical Armenian:

1. In pre-Armenian (as in pre-Slavic, pre-Baltic, pre-Albanian, and pre-Indo-Iranian), the velars developed palatalized allophones when contiguous with front vowels, apophonic **o*, and **y*. Next, the labiovelars were (perhaps only partially at first) delabialized. The newly delabialized (labio)velars then merged with the unpalatalized allophones of the velars. This change brought about the phonemicization of the palatals since both palatalized velars (from earlier plain velars) and unpalatalized velars (from earlier labiovelars) were now found in the vicinity of front vowels, apophonic **o*, and **y*.
2. Next, the glottalics were deglottalized: **p’*, **t’*, **k’*^{y}, **k’* > **p*, **t*, **k*^{y}, **k*. Notes: There are no examples of **p’* in Armenian.
3. Then, the plain voiced stops became voiced aspirates: **b*, **d*, **g*^{y}, **g* > **b*^{h}, **d*^{h}, **g*^{yh}, **g*^{h}. This was a context-free development. It should be noted that Grassmann’s Law did not operate in Armenian (cf. Vennemann 1989:239).

4. The pre-Armenian voiced aspirates remained except that, medially between vowels, *b^h > *w*, *g^{yh} > *j^h /d͡zʰ/ > *z*, and *g^h > *ž*, while *g^h remained initially before back vowels but was changed to *ǰ* /d͡žʰ/ before front vowels.
5. The syllabic resonants *$m̥$, *$n̥$, *$l̥$, *$r̥$ developed into **a* plus **m*, **n*, **l*, **r*: *$m̥$, *$n̥$, *$l̥$, *$r̥$ > *am*, *an*, *al*, *ar* (*ar̰* before *n*).
6. *l* became *ł* before consonants.
7. **w* became *g* or *v*.
8. **s* became *h* or *Ø* initially before vowels.
9. As in Indo-Iranian, Slavic, and Lithuanian, **s* became *š* after *r*.
10. **sk* and **ks* became *ç*.

At a later date, earlier clusters of voiceless stop plus laryngeal developed as follows (cf. Martirosyan 2010:716—717):

pH	>	p^h
tH	>	t^h
kH	>	x

In Armenian, some of the reflexes of the original voiceless aspirates merged with the reflexes of the new voiceless aspirates. This happened in the case of certain onomatopoeic terms, where, for example, original *p^h and *k^h appear as p^h and *x*, respectively, as if they were from earlier **pH* and **kH*. In like manner, the aspiration of the original voiceless aspirates was preserved in Armenian after initial **s*- (a similar development took place in Indo-Iranian). Finally, *t^h and **tH* have mostly merged in Armenian, though earlier *rt^h has become *rd*, while **rtH* has become rt^h (cf. Meillet 1967:104—105 and 1984:78—79).

The Armenian developments may be summarized as follows:

I Palatalization of velars and delabialization of labiovelars	II Deglottalization of ejectives	III Development of voiced aspirates	IV Classical Armenian (traditional transcription)
p^h, (p’), b	> p^h, (p), b	> p^h, (p), b^h	> h (w, Ø), -, b (w)
t^h, t’, d	> t^h, t, d	> t^h, t, d^h	> t^h, t, d
k^{yh}, k’^{y}, g^y	> k^{yh}, k^y, g^y	> k^{yh}, k^y, g^{yh}	> s, c, j (z)
k^h, k’, g	> k^h, k, g	> k^h, k, g^h	> k^h, k, g (ǰ, ž)

Note: As noted above, glottalization is preserved in some Modern Armenian dialects.

The Classical Armenian consonant system is as follows (cf. Godel 1975:9; Macak 2017:1042; Vaux 1998; Meillet 1936:23—59):

	Voiceless Aspirated	Voiceless Unaspirated	Voiced	Nasals
Stops	p^h	p	b	m
	t^h	t	d	n
	k^h	k	g	
Affricates	c^h	c	j	
	$č^h$	č	ǰ	
Fricatives		s	z	
		š	ž	
		h		
		x		
Liquids		l	ł	
		r	ṙ	
Glides		v w	y	

Notes:
1. The voiceless aspirated series is more often transcribed as follows: pʿ, tʿ, kʿ, cʿ, čʿ, respectively.
2. As noted above, /b/, /d/, /g/, /j/, and /ǰ/ were voiced aspirates.

Armenian is the only non-Anatolian daughter language that has preserved a trace of a consonantal laryngeal. Kuryłowicz's *$ə_2$ (Sturtevant's **x*) appears as *h* initially before full-grade vowels in a small number of words (cf. Winter 1965:102). The following examples have cognates in the Anatolian languages:

1. Armenian *hav* 'grandfather' (< pre-Armenian **hawhos*): Hittite *ḫuḫḫaš* 'grandfather'; Hieroglyphic Luwian *huhas* 'grandfather'; Lycian *χuga-* 'grandfather'. Cf. Latin *avus* 'grandfather'; Gothic *awō* (f.) 'grandmother'; Old Irish *áue* 'grandson'; Lithuanian *avýnas* 'uncle'. Kloekhorst 2008:352—353; Puhvel 1984— .3:355—358.

2. Armenian *hoviw* ‘shepherd’ (< pre-Armenian **howi-pā-*): Hittite (nom. sg. or pl. ?) *ḫa-a-u-e-eš* ‘sheep’; Cuneiform Luwian *ḫa-a-ú-i-iš* ‘sheep’; Hieroglyphic Luwian *hawis* ‘sheep’; Lycian *χava* ‘sheep’. Cf. Sanskrit *ávi-ḥ* ‘sheep’; Greek ὄϊς, οἶς ‘sheep’; Latin *ovis* ‘sheep’; Lithuanian *avìs* ‘sheep’. Kloekhorst 2008: 337—338; Puhvel 1984— .3:279—280.
3. Armenian *haravunkʰ* ‘arable land’ (< pre-Armenian **har-* ‘to plow’): Hittite *ḫarašzi* ‘to plow’. Cf. Greek ἀρόω ‘to plow, to till’; Latin *arō* ‘to plow, to till’; Gothic *arjan* ‘to plow’; Lithuanian *ariù* ‘to plow, to till’; Tocharian B *āre* ‘plow’. But note Armenian *arawr* ‘plow’ without initial *h*. On the other hand, Puhvel (1984— .3:184—185) derives the Hittite form from Akkadian *ḫarāšu* ‘to plant’ or *ḫarāṣu* ‘to dig a furrow’; but cf. Tischler 1977— :182—183; Kloekhorst 2008:312—314.
4. Armenian *hogi* ‘wind, spirit’ (< pre-Armenian **howyo-*), *hov* ‘wind’, *hovem* ‘to let air in’: Hittite *ḫuwanza* ‘wind’. Cf. Sanskrit *vā́ti* ‘to blow’; Greek ἄημι ‘to blow, to breathe’; Latin *ventus* ‘wind’; Gothic *winds* ‘wind’; Tocharian A *want* ‘wind’; Lithuanian *vė́jas* ‘wind’. Puhvel 1984— .3:428—429; Kloekhorst 2008:368.
5. Armenian *han* ‘grandmother’ (< pre-Armenian **hano-s*): Hittite *ḫannaš* ‘grandmother’; Lycian *χñna-* or *χñni-* ‘grandmother’. Cf. Latin *anus* ‘old woman’; Old High German *ana* ‘grandmother’. Puhvel 1984— .3:84—86; Kloekhorst 2008:285—286.
6. Armenian *harkanem* ‘to split, to fell’ (< pre-Armenian **hark'-*): Hittite *ḫarakzi* ‘to be destroyed’. Cf. Old Irish *orgaim* ‘to strike, to destroy’. This etymology is rejected by Puhvel 1984— .3:157—168; but cf. Benveniste 1935:162; Kloekhorst 2008:306—307.
7. Armenian *haçi* ‘ash-tree’ (< pre-Armenian **haskʸo-*): Hittite ^{GIŠ}*ḫaššikka-* ‘a tree and its fruit (?)’. Cf. Old Icelandic *askr* ‘ash-tree’; Old High German *ask* ‘ash-tree’ (< Proto-Germanic **aski-z*). Tischler 1977— :200—201. This comparison is not mentioned in Puhvel 1984— .3:232.
8. Armenian *Hay* ‘Armenian’: Hittite *Ḫayaša* the name of a region (cf. Meillet 1936:9). No doubt this term has been borrowed by Armenian.

The following examples have no known Anatolian cognates:

1. Armenian *hav* ‘bird’ (< pre-Armenian **hawi-s*): Latin *avis* ‘bird’; Sanskrit *ví-ḥ* ‘bird’.
2. Armenian *hot* ‘smell’ (< pre-Armenian **hot’os-*): Latin *odor* ‘smell’; Greek ὄζω ‘to smell’.
3. Armenian *hum* ‘raw’ (< pre-Armenian **hōmo-s*): Sanskrit *āmá-ḥ* ‘raw’; Greek ὠμός ‘raw’.

The Armenian material is not without problems, however. Both Meillet (1936:38) and Winter (1965:102) point out that initial *h* is unstable. This means that the same word sometimes has two alternates, one with *h-* and one without — Meillet’s example is *hogi* ‘wind, spirit’ beside *ogi*. Furthermore, *h-* is sometimes missing where the Hittite cognate unequivocally points to original **H₂* (= **ḫ₂*) such as in Armenian *arcatʰ* ‘silver’ beside Hittite *ḫarkiš* ‘white’ (other cognates include Greek ἀργός ‘bright, white’ and Latin *argentum* ‘silver’). Consequently, the Armenian material, though extremely valuable, must be used with caution.

The Neogrammarians and their followers — with the exception of Ferdinand de Saussure — did not reconstruct laryngeals as part of the Proto-Indo-European phonological system. However, they had all of the tools at their disposal to do so. First of all, as early as 1878, de Saussure had posited his now famous “coefficients sonantiques” solely on the basis of an analysis of the patterns of vowel gradation. Secondly, Armenian has a clear reflex of one of de Saussure’s “coefficients”. Unfortunately, the Armenian evidence escaped detection until after the discovery in 1927 by Kuryłowicz that one of de Saussure’s “coefficients” was preserved in Hittite. It was only then that the Armenian material was re-examined by Austin (1942:22—25) and the laryngeal reflex found. It should be noted that Albert Cuny made the same discovery at the same time (1927) as Kuryłowicz.

For more information on the inner-Armenian developments, cf. Fleming 2000; Godel 1975:69—91; Macak 2017; Meillet 1936: 23—59; Vaux 1998; Martirosyan 2010:705—748.

INDO-IRANIAN

For the pre-Indo-Iranian dialect of Disintegrating Indo-European, I would reconstruct the obstruent system as follows

(column 1 is voiceless aspirated, column 2 is plain voiceless, and column 3 is voiced aspirated) (note: glottalization is not needed in order to account for the Indo-Iranian developments of series 2):

	(1)	(2)	(3)	
Obstruents:	p^h	p	b^h	(bilabial)
	t^h	t	d^h	(dental)
	k^{yh}	k^y	g^{yh}	(palatovelar)
	k^h	k	g^h	(velar)
	k^{wh}	k^w	g^{wh}	(labiovelar)

The changes leading from the pre-Indo-Iranian to Proto-Indo-Iranian are particularly complicated. The first three steps are identical to what is assumed to have happened in pre-Armenian (and also pre-Greek and pre-Italic).

1. In pre-Indo-Iranian (as in pre-Slavic, pre-Baltic, pre-Albanian, and pre-Armenian), the velars developed palatalized allophones when contiguous with front vowels, apophonic **o*, and **y*. Next, the labiovelars were (perhaps only partially at first) delabialized. The newly delabialized (labio)velars then merged with the unpalatalized allophones of the velars. This change brought about the phonemicization of the palatals since both palatalized velars (from earlier plain velars) and unpalatalized velars (from earlier labiovelars) were now found in the vicinity of front vowels, apophonic **o*, and **y*.
2. Next, the glottalics were deglottalized: **p'*, **t'*, **k'*^{y}, **k'* > **p*, **t*, **k*^{y}, **k*.
3. Then, the plain voiced stops became voiced aspirates: **b*, **d*, **g*^{y}, **g* > **b*^{h}, **d*^{h}, **g*^{yh}, **g*^{h}. This was a context-free development. This was the stage reached by Armenian.
4. When two voiced aspirates cooccurred in a root, the first was deaspirated (Grassmann's Law). It should be noted that Grassmann's Law only appears in Old Indic. In Iranian (Old Persian and Avestan), the plain voiced stops and the voiced aspirates have the same treatment (cf. Kent 1953:29).
5. In pre-Indo-Iranian (and in pre-Greek and pre-Italic), but unlike pre-Armenian, the plain (unaspirated) voiceless stops (from earlier glottalics) developed into plain (unaspirated) voiced stops: **p*, **t*, **k*^{y}, **k* > **b*, **d*, **g*^{y}, **g*. This was a context-free development. (As a typological parallel, it may be

noted that an identical change has taken place in the Northwest Caucasian language Kabardian.)

	(1)	(2)	(3)	
Obstruents:	p^h	b	b^h	(bilabial)
	t^h	d	d^h	(dental)
	k^{yh}	k^y	g^{yh}	(palatovelar)
	k^h	g	g^h	(velar)
	k^{wh}	g^w	g^{wh}	(labiovelar)

6. The imbalance caused by the voicing of the plain voiceless stops caused the voiceless aspirates to be partially deaspirated.

	(1)	(2)	(3)	(4)	
Obstruents:	p	p^h	b	b^h	(bilabial)
	t	t^h	d	d^h	(dental)
	k^y	k^{yh}	k^y	g^{yh}	(palatovelar)
	k	k^h	g	g^h	(velar)
	k^w	k^{wh}	g^w	g^{wh}	(labiovelar)

   The deaspiration took place everywhere except (A) after initial **s*- and (B) in onomatopoeia. However, aspiration was lost in the clusters **sp*^{h}-, **st*^{h}-, **sk*^{h}- when an earlier laryngeal followed in the stem or when another aspirated stop followed in the stem: **(s)t*^{h}*eHy*- > **(s)teHy*- > **(s)tāy*- (cf. Sanskrit *stāyati* ‘he, she steals’, *stāyú-ḥ*, *tāyú-ḥ* ‘thief, robber’); **(s)t*^{h}*eHi*- > **(s)teHi*- > **(s)tai*- (cf. Sanskrit *stená-ḥ* ‘thief’, *stéya-ḥ* ‘theft, robbery’). **(s)t*^{h}*enH*- > **(s)tenH*- > **(s)ten*- (cf. Sanskrit *stanati* ‘resounds, reverberates’). Note: Apparent exceptions to these rules appear to be due to the generalization of variant forms of the stems in question, or, in some cases, they are due to borrowing.
7. Additional voiceless aspirates arose from earlier clusters of voiceless stop plus laryngeal: **pH*, **tH*, **kH* > **p*^{h}, **t*^{h}, **k*^{h}, respectively.
8. **s* was changed into **š* after **r*, **u*, **k*, **i* (this is the so-called “ruki-rule”). A similar change is also found in Slavic.
9. **k*^{y}, **g*^{y}, **g*^{yh} were affricated to **t͡s*, **d͡z*, **d͡z*^{h}, respectively (cf. Burrow 1973:74).

10. Following that, the velars **k*, **g*, **g^h* were palatalized to **k^y*, **g^y*, **g^{yh}*, respectively, before **$\check{e}$*, **$\check{\imath}$*, and **y* (cf. Mayrhofer 1972:24). Note: **k^h* was not palatalized.
11. After the palatalization of the velars had taken place, the short vowels merged into **a*, and the long vowels merged into **ā*. Original **o* became *ā* in open syllables (Brugmann's Law).
12. The syllabic nasals became *a*, and the syllabic laryngeal (**$\underset{\circ}{h}$*) partially merged with *i*.
13. **h* was then lost after *a* (< **$\underset{\circ}{m}$* and **$\underset{\circ}{n}$*) with compensatory lengthening.
14. **r* and **l* merged into *r*, and **$\underset{\circ}{r}$* and **$\underset{\circ}{l}$* merged into *$\underset{\circ}{r}$*.

In Avestan and Old Persian, the plain and aspirated voiced stops merged. The voiceless aspirates became fricatives except after a sibilant, where they were deaspirated. The plain voiceless stops developed into fricatives when immediately followed by a consonant unless a sibilant preceded.

In Old Indic (Vedic and Classical Sanskrit), **$\underset{\frown}{dz}$* and **g^y* merged into *j*, and **$\underset{\frown}{dz}^h$* and **g^{yh}* merged into *h*.

The Old Indic phonological system was as follows (column 1 is plain voiceless, column 2 is voiceless aspirated, column 3 is plain voiced, column 4 is voiced aspirated, and column 5 is nasal (cf. Burrow 1973:67—117; Kobayashi 2017:231; Mayrhofer 1972:17):

	(1)	(2)	(3)	(4)	(5)
Velar:	k	kh	g	gh	ṅ
Palatal:	c	ch	j	jh	ñ
Retroflex:	ṭ	ṭh	ḍ	ḍh	ṇ
Dental:	t	th	d	dh	n
Bilabial:	p	ph	b	bh	m
Semivowels:	y	r	l	v	
Sibilants:	ś	ṣ	s		
Aspirate:	h				
Visarga:	ḥ				
Anusvāra:	ṁ				

Vowels:	a	i	u	ṛ	ḷ	e	o
	ā	ī	ū	ṝ			

Diphthongs:	ai	au

Once the above system was established, it remained remarkably stable for well over three thousand years — the phonological systems of the modern Indo-Aryan languages remain to this day similar in structure to the phonological system of Old Indic (cf. Bloch 1965:96—97; Kobayashi 2004; see Ghatage 1962 for examples). This fact raises an interesting question about the phonological system reconstructed for the Indo-European parent language by the Neogrammarians: The Neogrammarian reconstruction is extremely close to the phonological system of Old Indic. If the Neogrammarian system were in fact an accurate representation of what had existed in Proto-Indo-European, one may legitimately ask why it, too, did not remain stable in the majority, if not all, of the Indo-European daughter languages. It thus seems to be a fair conclusion that the Proto-Indo-European phonological system was not in fact similar to that of Old Indic and that the Old Indic system was an innovation.

GREEK

For the pre-Greek dialect of Disintegrating Indo-European, I would reconstruct the obstruent system as follows (column 1 is voiceless aspirated, column 2 is plain voiceless, and column 3 is voiced aspirated) (note: glottalization in is not needed in order to account for the Greek developments of series 2):

	(1)	(2)	(3)	
Obstruents:	p^h	p	b^h	(bilabial)
	t^h	t	d^h	(dental)
	k^h	k	g^h	(velar)
	k^{wh}	k^w	g^{wh}	(labiovelar)

Many of the early pre-Greek developments were similar to what is assumed to have happened in pre-Armenian and pre-Indo-Iranian. However, Greek is a so-called “centum” language, which means that it initially preserved the original contrast between velars and labiovelars. Unlike pre-Armenian and pre-Indo-Iranian, but similar to Italic, Greek changed the voiced aspirates into voiceless aspirates.

The following series of changes can be postulated for the development of the Disintegrating Indo-European system of obstruents into the system found in Proto-Greek:

1. First, the glottalics were deglottalized: **p'*, **t'*, **k'*, **k'^{w}* > **p*, **t*, **k*, **k^{w}*.
2. Then, the plain voiced stops became voiced aspirates: **b*, **d*, **g*, **g^{w}* > **b^{h}*, **d^{h}*, **g^{h}*, **g^{wh}*. This was a context-free development.
3. As in Old Indic, when two voiced aspirates cooccurred in a root, the first was deaspirated (Grassmann's Law).
4. In pre-Greek (and in pre-Indo-Iranian and pre-Italic), but unlike pre-Armenian, the plain (unaspirated) voiceless stops (from earlier glottalics) developed into plain (unaspirated) voiced stops: **p*, **t*, **k*, **k^{w}* > **b*, **d*, **g*, **g^{w}* (cf. Gamkrelidze—Ivanov 1995.I:52—57). This was a context-free development.

	(1)	(2)	(3)	
Obstruents:	p^{h}	b	b^{h}	(bilabial)
	t^{h}	d	d^{h}	(dental)
	k^{h}	g	g^{h}	(velar)
	k^{wh}	g^{w}	g^{wh}	(labiovelar)

5. The imbalance caused by the voicing of the plain voiceless stops caused the voiceless aspirates to be partially deaspirated.

	(1)	(2)	(3)	(4)	
Obstruents:	p	p^{h}	b	b^{h}	(bilabial)
	t	t^{h}	d	d^{h}	(dental)
	k	k^{h}	g	g^{h}	(velar)
	k^{w}	k^{wh}	g^{w}	g^{wh}	(labiovelar)

Note: Emonds (1972:120) also assumes that some of the examples of voiceless aspirates found in Indo-Iranian, Greek, and Armenian are derived from the original voiceless aspirates, that is to say, they failed to undergo the expected deaspiration. Edmonds accounts for this by "reintroduction from a dialect that did not undergo Z2 [deaspiration]". In other words, he sees them as borrowings. While this may be true in some cases, I

prefer to see them mostly as the natural result of developments within these branches themselves.

6. Additional voiceless aspirates arose from earlier clusters of voiceless stop plus laryngeal: **pH*, **tH*, **kH* > **p^h*, **t^h*, **k^h*, respectively.
7. At a later date, the voiced aspirates were devoiced — the unaspirated allophones became plain (unaspirated) voiceless stops, and the aspirated allophones became voiceless aspirates: **b* ~ **b^h*, **d* ~ **d^h*, **g* ~ **g^h*, **g^w* ~ **g^{wh}* > **p* ~ **p^h*, **t* ~ **t^h*, **k* ~ **k^h*, **k^w* ~ **k^{wh}*. The newly-formed plain and aspirated voiceless stops merged completely with the previously-existing plain and aspirated voiceless stops. As a typological parallel, it may be noted that similar devoicing of earlier voiced aspirates took place in Romany (cf. Meillet 1967:100 and 1984:76).

The labiovelars were eliminated in Greek in historic times. The process of elimination probably occurred in several stages. Since the labiovelars mostly remain in Mycenaean, their elimination can reasonably be placed between the Mycenaean period and the beginning of the alphabetic period, that is, between about 1400—900 BCE (cf. Lejeune 1972:43—53). The developments were as follows:

1. Before or after *u*, **k^w*, **k^{wh}*, and **g^w* were delabialized, and the resulting phonemes merged with *k*, *k^h*, and *g* (written κ, χ, and γ), respectively.
2. Next, **k^w*, **k^{wh}*, and **g^w* were palatalized before *ĕ̆* and *ĭ̆*. The resulting sounds then merged with *t*, *t^h*, and *d* (written τ, θ, and δ), respectively, in the majority of Greek dialects.
3. Finally, all remaining labiovelars became bilabials: **k^w*, **k^{wh}*, and **g^w* > *p*, *p^h*, and *b* (written π, φ, and β).

**m*, **n*, **l*, **r* generally remained in Greek except that final **-m* became *-n* (written ν) as in Anatolian, Germanic, Celtic, and probably Baltic and Slavic. **m̥*, **n̥*, **l̥*, **r̥* developed into αμ, αν, αλ, αρ, respectively, before vowels. Before consonants, **m̥* and **n̥* merged into α, while **l̥* and **r̥* became αλ/λα and αρ/ρα, respectively.

**s*, **y*, and **w* were lost medially between vowels. Initially before vowels, **s* became *h* (written ʿ), **y* became either *h* or *z* (written ʿ and ζ, respectively), while **w* was lost in Attic-Ionic. **s* remained when final and when before or after voiceless stops.

The vowels and diphthongs were well-preserved in all of the Greek dialects. The most important change was that of ᾱ to η in Attic-Ionic. Additional changes worth mentioning include the compensatory lengthening of short vowels, the shortening of long vowels, and the development of new long vowels through contraction. For more information on the Greek developments, cf. Lejeune 1972:187—263.

ITALIC

Italic is divided into two distinct branches, namely, Oscan-Umbrian (also called Sabellian or Sabellic) and Latin-Faliscan. The Oscan-Umbrian branch includes a number of poorly-attested languages besides Oscan and Umbrian — these include Aequian, Marrucinian, Marsian, Paelignian, Sabinian, Southern Picenian, Vestinian, and Volscian (cf. Sihler 1995:14). The differences between Oscan-Umbrian, on the one hand, and Latin-Faliscan, on the other, are extremely pronounced, so much so that some scholars deny any special relationship between these two groups and see them instead as two separate branches of Indo-European (for a discussion of the issues involved, cf. Beeler 1966:51—58).

For the pre-Italic dialect of Disintegrating Indo-European, I would reconstruct the obstruent system as follows (column 1 is voiceless aspirated, column 2 is plain voiceless, and column 3 is voiced aspirated) (note: glottalization is not needed in order to account for the Italic developments of series 2):

	(1)	(2)	(3)	
Obstruents:	p^h	p	b^h	(bilabial)
	t^h	t	d^h	(dental)
	k^h	k	g^h	(velar)
	k^{wh}	k^w	g^{wh}	(labiovelar)

Many of the early pre-Italic developments were similar to what is assumed to have happened in pre-Greek. Like Greek, Italic belonged to the so-called “centum” languages, which means that it

initially preserved the original contrast between velars and labiovelars.

The following series of changes can be postulated for the development of the Disintegrating Indo-European system of obstruents into the system found in Proto-Italic:

1. First, the glottalics were deglottalized: **p'*, **t'*, **k'*, **k'^{w}* > **p*, **t*, **k*, **k^{w}*.
2. Then, the plain voiced stops became voiced aspirates: **b*, **d*, **g*, **g^{w}* > **b^{h}*, **d^{h}*, **g^{h}*, **g^{wh}*. This was a context-free development. Note: Grassmann's Law did not operate in Italic.
3. In pre-Italic (and in pre-Indo-Iranian and pre-Greek), but unlike pre-Armenian, the plain (unaspirated) voiceless stops (from earlier glottalics) developed into plain (unaspirated) voiced stops: **p*, **t*, **k*, **k^{w}* > **b*, **d*, **g*, **g^{w}* (cf. Gamkrelidze—Ivanov 1995.I:57—65). This was a context-free development.

	(1)	(2)	(3)	
Obstruents:	p^{h}	b	b^{h}	(bilabial)
	t^{h}	d	d^{h}	(dental)
	k^{h}	g	g^{h}	(velar)
	k^{wh}	g^{w}	g^{wh}	(labiovelar)

4. The imbalance caused by the voicing of the plain voiceless stops caused the voiceless aspirates to be partially deaspirated.

	(1)	(2)	(3)	(4)	
Obstruents:	p	p^{h}	b	b^{h}	(bilabial)
	t	t^{h}	d	d^{h}	(dental)
	k	k^{h}	g	g^{h}	(velar)
	k^{w}	k^{wh}	g^{w}	g^{wh}	(labiovelar)

5. Additional voiceless aspirates arose from earlier clusters of voiceless stop plus laryngeal: **pH*, **tH*, **kH* > **p^{h}*, **t^{h}*, **k^{h}*, respectively.
6. At a later date, the voiced aspirates were devoiced: **b^{h}*, **d^{h}*, **g^{h}*, **g^{wh}* > **p^{h}*, **t^{h}*, **k^{h}*, **k^{wh}*. The newly-formed aspirated

voiceless stops merged completely with the previously-existing aspirated voiceless stops.

7. Finally, the voiceless aspirates (from earlier voiced aspirates as well as from clusters of voiceless stop plus laryngeal) became voiceless fricatives.

b^h	>	p^h	>	φ	>	f
d^h	>	t^h	>	θ	>	f
g^h	>	k^h	>	χ	>	h
g^{wh}	>	k^{wh}	>	$χ^w$	>	f

In Oscan and Umbrian, **φ*, **θ*, and **$χ^w$* merged into *f*, while **χ* became *h*. In Latin, the merger of **φ*, **θ*, and **$χ^w$* into *f* only took place initially. **φ* became *b* medially; **θ* became (A) *d* medially but (B) *b* before or after *r*, before *l*, or after *u*; and **$χ^w$* became (A) *v* between vowels, (B) *gu* after *n*, but (C) *g* before consonants or *u*. **χ* became (A) *h* initially in Latin but (B) *g* when before or after consonants and (C) *f* when before *u*.

**m*, **n*, **l*, **r* were preserved. **y* remained initially in Latin (written *i*) but was lost between vowels, while **w* (written *v*) was unchanged. **m̥*, **n̥*, **l̥*, **r̥* developed into *a* plus *m*, *n*, *l*, *r*, respectively, before vowels. Elsewhere, **l̥* and **r̥* became *ol* and *or*, respectively, and **m̥* and **n̥* became *em* and *en*, respectively.

**s* generally remained, though it was voiced to *z* between vowels. The *z* was retained in Oscan but was changed to *r* in Umbrian and Latin.

The vowels generally remained in accented syllables but were weakened or lost in unaccented syllables. The vowels underwent the following modifications in Latin (cf. Buck 1933:78—117). Final *i* became *e*. *e* became *i* before *ng*, *gn*, *nc*, and *ngu*. *e* became *o* before or after *w* and before *l*. *o* became *u* (1) before *nc*, *ngu*, *mb*, and before *l* plus a consonant, (2) in final syllables ending in a consonant, and (3) medially before *l* or before two consonants. *vo* became *ve* before *r* plus a consonant, before *s* plus a consonant, and before *t*. *ov* became *av*.

The diphthongs were preserved in Oscan but underwent various changes in Umbrian and Latin. *ei* became *ī*, and *oi*, *eu*, and *ou* became *ū* in Latin.

For details on the inner-Italic developments, cf. Buck 1933: 78—167 (Latin and Greek); Lindsay 1894:219—315; Meisser

2017:743—751; Sihler 1995: 35—242 (Latin and Greek); Stuart-Smith 2004; Wallace 2017: 325—329; Weiss 2009:31—193.

CONCLUDING REMARKS

The phonological developments in each Indo-European branch are far more complicated than indicated in this paper. Only the main lines of development have been traced here, the purpose being to show how the Glottalic Model of Proto-Indo-European consonantism can account for the phonological developments in the main non-Anatolian Indo-European daughter languages in a completely natural, straightforward, and plausible manner. To that end, trajectories of the developments in each branch are provided. The various comparative grammars and handbooks listed in the references at the end of this paper should be consulted for details about further developments in the various daughter languages.

Particular emphasis has been placed in this paper on Armenian as the key to understanding the developments in Old Indic, Greek, and Italic. It may be noted that the trajectories for each of these branches leads directly to the traditional, Neogrammarian system of stops at a certain period in their prehistory (cf. Joseph—Wallace 1994) (column 1 is plain voiceless, column 2 is voiceless aspirated, column 3 is plain voiced, and column 4 is voiced aspirated):

	(1)	(2)	(3)	(4)	
Obstruents:	p	p^h	b	b^h	(bilabial)
	t	t^h	d	d^h	(dental)
	k^y	k^{yh}	k^y	g^{yh}	(palatovelar)
	k	k^h	g	g^h	(velar)
	k^w	k^{wh}	g^w	g^{wh}	(labiovelar)

This is identical to Brugmann's reconstruction (1904:52), though Brugmann uses a different transcription:

	(1)	(2)	(3)	(4)	
Occlusives:	p	ph	b	bh	(bilabial)
	t	th	d	dh	(dental)
	$\hat{k}$	$\hat{k}$h	$\hat{g}$	$\hat{g}$h	(palatal)
	q	qh	g	gh	(pure velar)
	$q^{\underline{u}}$	$q^{\underline{u}}$h	$g^{\underline{u}}$	$g^{\underline{u}}$h	(labiovelar)

However — and this must be strongly emphasized —, such a reconstruction is only needed to account for developments in these branches. This is clearly a late development in the Disintegrating Indo-European antecedents of Old Indic, Greek, and Italic and is not in any way representative of earlier periods of development within the Indo-European parent language.

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Revised 27 January 2023